Bicycle Detection at Signalized Intersections

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CITY OF PALO ALTO

- *   Bicycle Friendly Community
- *   6% of Commuters use Bicycles
- *   Bike lanes –more than 30 miles
- *   Bike paths -7.5 miles
- *   Bicycle bridges-11

Situation of the Bicyclists

- Bicyclists stop at intersection

- Rolling or Moving Bicyclists during green

Concerns:

- Anticipation of "green light"
- Display confusion
- Call Traffic Engineer's office to display frustration

What's wrong?

Problems are:
- 1)   No bicycle markings
- 2)   The bicyclists are idle on incorrect location
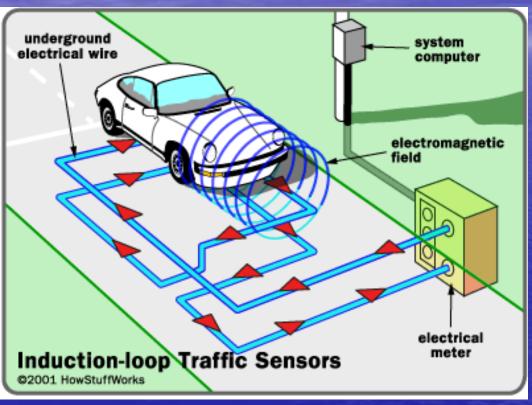- 3)   The detectors clearly did not work for the bicyclists

Types of Bicycle Detection

- Inductive Loops
- Video
- Infrared
- Microwave
- Magnetometers

Video Detection Method

Inductive Loop Method

Induction-loop Traffic Sensors
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underground electrical wire

system computer

electromagnetic field

electrical meter

Advantages
And
Disadvantages
of
different detectors

Advantages:

Inductive Loops:
- High sensitivity (types: D, Q and DQ) loop detectors work well

Video:
- During installation, lane closures are not necessary
- Can be used in areas with deteriorated pavement
- Easy to relocate detection zones
- More reliable and can detect any object, even without metal

Microwave:
- During installation, lane closures are not necessary
- Can be used in any surface
- Can be use for pedestrian detection

Infrared:
- During installation, lane closures are not necessary
- Can be used in any surface

Magnetometers:
- For special locations, such as on or under bridges

Disadvantages:

Inductive:
- Ineffective if cyclists are unaware of the exact location
- The equipment may not be capable of detecting all types of bicycles
- Hard to install on rigid surfaces

Video:
- Heavy weather conditions may reduce effectiveness
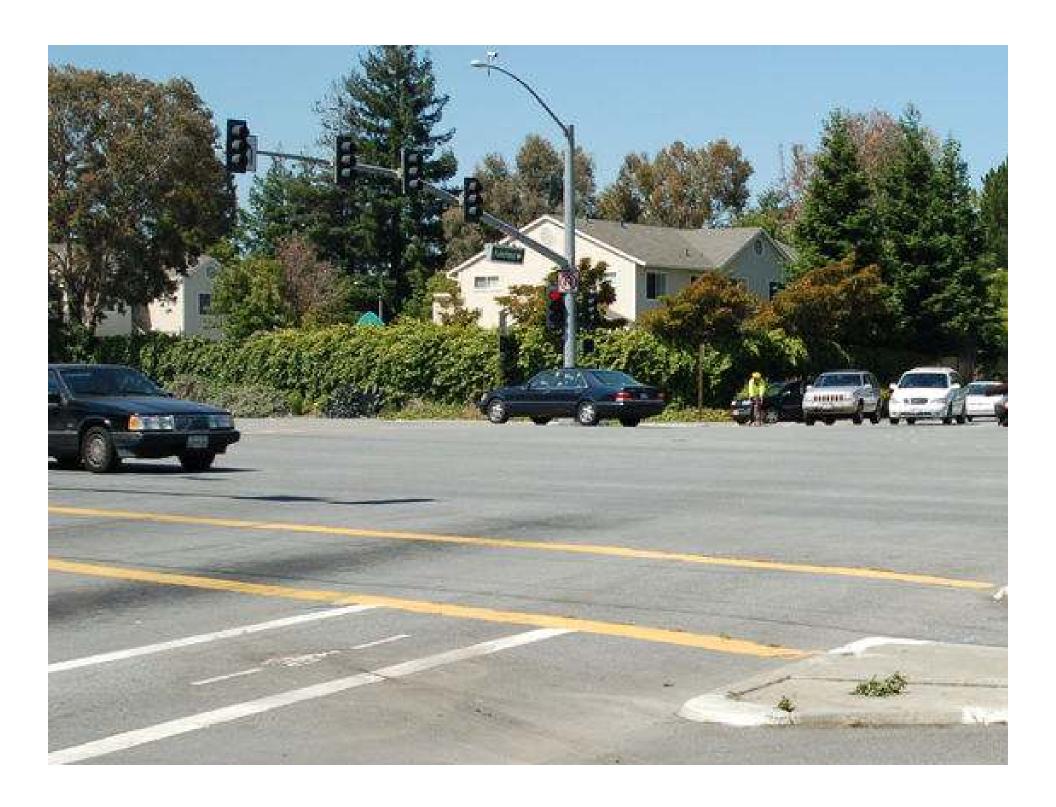- Higher cost

Microwave:
- Complex to maintain
- Difficult to use in a presence mode

Infrared:
- Difficult to detect smaller masses (especially children on bicycles)
- Weather makes detection unreliable

Magnetometers:
- Very small detection zone area

Bicyclists Analysis (Average Speed and Delay)

	Advanced (ft/s)	Delay (sec)	Children (ft/s)
ITE	26	36-48	13
Palo Alto Study with out Detector loops	27	33-36	Use Crosswalk
Palo Alto Study with Detector loops	33	26-30	Use Crosswalk
% Change	22% Increase	21% Decrease	

Reaction time: 1 Second

Bicycle speed: 8 mph (12 ft/s)

The Actions Implemented and Our Results:

Signal Controller Effects:

- The traffic signal controller features & limitations
- To provide bicycle specific signal timing at intersections when bicycles are present
- Set up an exclusive detector for bicycle loops
- Adjust detector sensitivity for bicycles
- Bicycle loops should be wired separately, so they may not interfere with vehicle detectors
- The direction with "Green on rest", identical pathway bicycle detection may not be necessary

- Signal Timing Adjustments to accommodate bicycles
- Adjust minimum green for bicycles
  (Longer than vehicle minimum green)
- Adjust clearance timing for bicycles
  (Yellow + Red)
- Green extension for Bicyclist
  (Longer than vehicle minimum green)

What we accomplished in Palo Alto:

- Special signal Phasing for Bicycles and Pedestrians

- Special signal timing program for bicyclists

- More protection for pedestrians and bicyclists.

- At beginning and end of the school, all traffic must stop during this phase to allow bicyclists and pedestrians to cross the street.

- Install "No Right Turn on Red When Children Are Present" sign

- Created more efficiency for bicycle riders

What's Next ?

- Develop the Bicycle Detection Program at each traffic signal
- Educate the public and schools "Location of detectors at traffic signals"
- Install advance detector loops for bicyclists
- Check malfunctions regularly
- Maximize detector efficiency for bicyclists
- Research for new technology

Bibliography

- http://traffic.berkeley.edu/newsreleases.html
- http://www.cityofpaloalto.org/civica/filebank/blobdload.asp?BlobID=3922
- http://www.enhancements.org/download/trb/1674-014.PDF
- http://tris.trb.org/view.aspx?type=MO&id=660486
- http://ntl.bts.gov/lib/23000/23300/23330/BikePedDetFinalReport.pdf
- http://www.bikeplan.com/aw-signals.pdf
- http://www.wc-ads.com/uploadedfiles/docresources/.pdf
- http://bikprt.com/massfacil/andard/MHD%20Report.doc

Thank you

- Questions ?